IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

AUTO-DRIL, INC.,	§	
	§	
Plaintiff,	§	
	§	
v.	§	CIVIL ACTION NO. H-16-280
	§	H-16-293
	§	
NATIONAL OILWELL VARCO, LP., CANRIG DRILLING TECHNOLOGY, LTD.	§	
	§	
	§	
Defendants.	§	

AMENDED
MEMORANDUM AND OPINION

This patent-infringement case involves braking and feedback technology for oil and gas drilling-control systems. Lowering pipe down an oil or gas drilling well puts pressure on the drill bit. Too much weight can damage the bit, costing time and money while it is repaired or replaced. To little weight results in slower drilling and less efficient production, both costly. To maximize efficiency and decrease costs, drillers need to put the "just right" weight on a drill bit.

Auto-Dril's U.S. Patent No. 6,994,172 (the '172 Patent) claims a system for more precise weight-on-bit measurement and control that achieves a better balance between the goals of increasing drilling speed and reducing damage to drilling components. (Docket Entry No. 21-1). The '172 Patent attempts to solve the problem of finding the Goldilocks "just right" weight-on-bit. The '172 Patent claims sensors that produce electronic signals indicating the weight-on-bit. The signals are received by a computer-based drilling system, which transmits them to an electric motor. The motor either increases the amount of brake applied to the drill string, reducing the weight-on-

bit, or reduces the amount of brake, increasing the weight-on-bit. The system auto-adjusts by comparing the actual bit weight with an operator-selected weight previously set in the system.

Auto-Dril alleges that National Oilwell Varco's "e-Wildcat" electronic autodrilling system and Canrig Drilling Technology's "DrillSmart" automatic drilling system infringes the '172 Patent. (Docket Entry Nos. 21, 45). The parties have asked the court to construe several disputed terms in the '172 Patent. Both parties filed opening claim-construction briefs, responses, and supplemental briefs. (Docket Entry Nos. 134, 135, 141, 142, 168, 171). The court held a *Markman* hearing on November 28, 2017, at which counsel argued their competing constructions. (Docket Entry Nos. 189, 188). Each party filed a posthearing brief. (Docket Entry Nos. 194, 195). The parties have also submitted multiple summary judgment filings on indefiniteness. Auto-Dril filed three motions for partial summary judgment on indefiniteness, the defendants responded, and Auto-Dril replied. (Docket Entry Nos. 175, 176, 179, 180, 182, 183, 184, 185, 186).

Based on the parties' claim-construction and summary judgment motions and briefs, counsels' arguments, the record, and the applicable law, the court construes the disputed claims as set out in detail below. Based on the construction, the court:

- denies Auto-Dril's first motion for partial summary judgment, (Docket Entry No. 175);
- grants Auto-Dril's second motion for partial summary judgment as to the claim terms "electronic weight-on-bit comparison means" and "programmable logic controller," (Docket Entry No. 176);
- denies Auto-Dril's second motion for partial summary judgment as to the claim terms "programmable control means," "motor control signal output means," and "signal output means," (Docket Entry No. 176); and

- denies Auto-Dril's third motion for partial summary judgment, (Docket Entry No. 179).

The court also sets a status and scheduling conference on **Wednesday, April 18, 2018** at **9:00 a.m.** The reasons for the court's claim-construction and summary judgment rulings are explained below.

I. Background

A. The parties

Auto-Dril is a corporation organized under Texas law and headquartered in Odessa, Texas. (Docket Entry No. 45 at 1). National Oilwell is a limited partnership organized under Delaware law and headquartered in Houston, Texas. *Id.* Canrig is a corporation organized under Delaware law, with its principal office in Houston. *Id.*

B. The infringement allegations

Auto-Dril alleges patent infringement, induced infringement, and contributory infringement under 35 U.S.C. § 271. Auto-Dril alleges that National Oilwell and Canrig infringed the '172 Patent by "making, using, selling, offering for sale, and/or importing in or into the United States, without authority, products that fall within the scope of one or more claims of the '172 Patent," including National Oilwell's "e-Wildcat" electronic autodrilling system and Canrig's "DrillSmart" automatic drilling system. Auto-Dril alleges that National Oilwell has known of the '172 Patent since at least 2010 and that Canrig has known of the Patent or has been "willfully blind" to its existence. Despite this knowledge, Auto-Dril alleges that the defendants have actively promoted sales of their infringing products to, and use by, third parties. Auto-Dril alleges that these third parties have used the defendants' technology to directly infringe one or more claims of the '172 Patent and that the defendants have sold automatic drilling-control system components and

accessories to third parties that have been used with other components to assemble an apparatus that falls within and infringes the '172 Patent claims. (Docket Entry No. 21 at 2–4; Case 4:16-cv-293, Docket Entry No. 1 at 2–4). Auto-Dril also asserts claims for fraud and breach of contract against National Oilwell. (Docket Entry No. 21 at 9–11. Against both defendants, Auto-Dril seeks damages and an injunction prohibiting future direct infringement, inducement of infringement, and contributory infringement of the '172 Patent. (Docket Entry No. 21 at 12; Case 4:16-cv-293, Docket Entry No. 1 at 7).

C. The disputed terms

The parties dispute 17 terms in claims 1, 2, and 3.[1] The meaning or definiteness of the following claim terms are disputed:

- "braking means" (claims 1 and 3);
- "electronic bit weight comparison means" (claims 1 and 2);
- "drill stem" (claim 1);
- "alternatively move said stem upward and downward" (claim 1);
- "a bit weight sensor" (claim 1);
- "a signal proportionate to any difference between said actual bit weight and said pre-selected bit weight value" (claim 1);
- "programmable control means" (claim 1);
- "in said upward or downward direction" (claim 1);
- "said signal" (claim 1);

[1] Several claim terms appear in Auto-Dril's opening claim-construction brief that are not contained in the parties' joint claim-construction chart or Auto-Dril's amended claim-construction chart, (Docket Entry Nos. 150-1, 171-2). These include: "prime mover," (Docket Entry No. 134 at 6); "variable drive electric motor," *id.* at 12; "user input means," *id.* at 15; "electric motor," *id.* at 20; and "gearbox," *id.* The court construes only the 17 claim terms included in the claim-construction charts.

- “programmable logic controller” (claim 2);
- “sensor means” (claim 3);
- “electronic weight-on-bit comparison means” (claim 3);
- “signal input means” (claim 3);
- “motor control signal output means” (claim 3);
- “computer data and program processing means” (claim 3);
- “variable motor control signal in proportion to any measured weight-on-bit” (claim 3); and
- “moving said braking means at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation” (claim 3).

The disputed terms are set out in bold:

> **1.** An automatic drilling system for regulating the release of a drill string of drilling rig during the drilling of a borehole, comprising:
>
> a **drill stem** having a drill bit at one end;
>
> drawworks coupled to said drill system;
>
> a prime mover engaged to said drawworks to cause said drawworks to **alternatively move said stem upward and downward**;
>
> **a bit weight sensor** configured for measuring bit weight through direct interface with bit support means which, at least in part, supports the weight of said drill bit, and which is electrically coupled to a [sic] **electronic bit weight comparison means**, where said bit weight comparison mens [sic] compares actual bit weight indicated by said bit weight sensor against a user-selected, bit weight value set into said electronic bit weight comparison means, and generates **a signal proportionate to any difference between said actual bit weight and said pre-selected bit weight value**;
>
> **programmable control means** operatively coupled to a variable drive electric motor which is interfaced with drill stem **braking**

means to proportionately effect movement of said drill string **in said upward or downward direction** upon receipt of signals from said electronic bit weight comparison means according to the value of **said signal**.

2. The automatic drilling system of claim 1 where the **electronic bit weight comparison means** includes a **programmable logical controller**.

3. A control system for governing drawworks braking in an earth drilling apparatus which includes a drill stem comprising:

sensor means for measuring weight-on-bit of said drill string configured for measuring bit weight directly through interface with bit support means which, at least in part, supports the weight of said drill bit, and for generating an electronic signal proportionate to measured weight-on-bit during a drilling operation;

electronic weight-on-bit comparison means comprising:

computer and memory means for storing program logic, data received from said sensor, and user input data;

user input means for inputting said user input data which is representative of a desired weight-on-bit for a drilling operation;

signal input means for receiving said electronic signal from said sensor means and for storing data representative of said electronic signal;

motor control signal output means for generating a variable motor control signal which is proportionate to a desired speed of operation of an electric motor operatively connected to said **motor control signal output means**;

computer data and program processing means for comparing said user input data against said data representative of said electronic signal and generating a motor control command for sad [sic] **motor control signal output means**, operably connected to said

> computer data and program processing means, to generate said **variable motor control signal in proportion to any measured weight-on-bit**; and
>
> an electronic motor operatively connected to said motor control signal output means and, via a gearbox, to braking means for, depending on the RPM rate of said electric motor, **moving said braking means at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation**, and RPM rate of said electric motor being governed by and proportionate to said motor control signal.

(Column 8, line 26–Column 10, line 13).

D. The procedural history

Auto-Dril initially filed this suit in the Western District of Texas in 2015, alleging that National Oilwell infringed the '172 Patent. (Docket Entry Nos. 1, 21). Auto-Dril also filed separate infringement complaints against Canrig and Pason Systems USA. *See* Case Nos. 4:16-cv-287, 4:16-cv-293. National Oilwell moved to transfer venue to the Eastern District of Texas; that motion was denied. (Docket Entry Nos. 12, 29). Auto-Dril moved to dismiss National Oilwell's affirmative defense of release, its breach-of-contract counterclaim, and its request for sanctions; that motion was denied. (Docket Entry Nos. 19, 48). Auto-Dril then moved to consolidate the three cases for pretrial purposes; that motion was granted. (Docket Entry Nos. 23, 45).

The consolidated case was stayed while National Oilwell petitioned for a writ of mandamus in the Federal Circuit, seeking a transfer of venue. (Docket Entry Nos. 46, 51). The Federal Circuit denied the petition and a petition for rehearing en banc. (Docket Entry Nos. 52, 59). After the stay was lifted, National Oilwell moved again to transfer venue, and its motion was granted. (Docket Entry Nos. 70, 71, 77, 88).

In February 2016, the consolidated case was transferred to the Southern District of Texas,

Houston Division, and assigned to this court. (Docket Entry Nos. 89, 91). The parties jointly moved to dismiss Pason, (Docket Entry Nos. 105, 106), leaving National Oilwell and Canrig as the defendants. National Oilwell unsuccessfully moved for a partial summary judgment as to noninfringement. (Docket Entry No. 161).

The parties then filed claim-construction briefs, responses, and replies. (Docket Entry Nos. 134, 135, 141, 142, 168, 171). The defendants' motions to strike parts of one of Auto-Dril's expert's declaration and one of its expert's report were denied. (Docket Entry Nos. 143, 167, 164, 174). Auto-Dril filed three motions for partial summary judgment on indefiniteness, the defendants responded, and Auto-Dril replied. (Docket Entry Nos. 175, 176, 179, 180, 182, 183, 184, 185, 186).

The *Markman* hearing was held on November 28, 2017. (Docket Entry Nos. 188, 189). Both sides filed a limited posthearing brief, addressing issues raised and discussed at the hearing. (Docket Entry Nos. 194, 195).

II. The record

A. The exhibits

The parties rely on an extensive record,[2] including the following:

- United States Patent No. 6,994,172 (Docket Entry No. 1-1);
- the '172 Patent file history (Docket Entry No. 135-5);
- Patent Application No. 09/369,723 (Docket Entry Nos. 135-3, 142-7, 157-4);
- an office action summary for Patent Application No. 09/369,723 (Docket Entry No. 157-15);
- United States Patent No. 5,474,142 (Docket Entry Nos. 141-2, 142-3);

[2] The parties attached exhibits to dozens of filings. Many filings have hundreds of pages of exhibits. This list references most of the exhibits, but is not exhaustive.

- Patent Application No. 10/178,802 (Docket Entry No. 175-5);
- the Patent and Trademark Office's response to Patent Application No. 10/178,802 (Docket Entry No. 142-9);
- Michael Stewart's declaration (Docket Entry Nos. 134-1, 142-2, 148-2, 171-3, 175-6, 176-7, 180-4, 182-2);
- Michael Stewart's deposition (Docket Entry Nos. 148-1, 153-18, 179-6, 180-2, 182-3, 185-1, 186-1);
- Kenneth Miller's expert report (Docket Entry Nos. 168-1, 171-2, 175-7, 176-4);
- Kenneth Miller's deposition (Docket Entry Nos. 168-2, 171-6, 176-5, 180-3, 182-4, 185-2, 194-2);
- Michael Porche's declaration (Docket Entry Nos. 168-6, 171-4);
- Michael Porche's deposition (Docket Entry Nos. 168-8, 171-1, 175-3, 176-6, 179-5, 184-2);
- Michael Porche's declaration in the case (Docket Entry Nos. 176-3, 175-2, 171-1, 179-4);
- Mallik Guggari's declaration (Docket Entry Nos. 168-7, 171-5, 179-2, 183-1);
- Mallik Guggari's deposition (Docket Entry No. 168-9);
- James Ray's declaration (Docket Entry No. 153-1);
- John Berryhill's deposition (Docket Entry Nos. 135-4, 153-4, 157-3);
- interrogatory answers (Docket Entry Nos. 141-1, 157-6, 183-4);
- dictionaries (Docket Entry Nos. 134 at 6, 134 at 11, 135-9, 137-1);
- the parties' joint stipulations (Docket Entry No. 109);
- *National Oilwell Varco v. Omron* briefing and the claim construction order (Docket Entry Nos. 142-4, 142-5, 142-8, 168-11);

- *Varco v. Mason Systems USA Corp.* briefing (Docket Entry No. 142-6);
- the *Mobil Telecommunications Technologies, LLC, v. ZTE (USA) Inc, et al.* claim construction order (Docket Entry No. 171-23);
- the Patent Trial and Appeal Board decision terminating the proceeding prior to institution due to settlement in case IPR2016-00624 (Docket Entry No. 175-5);
- a "Deadline Sensor" advertisement on Massload's website (Docket Entry Nos. 180-1, 182-1, 183-2);
- a search for "electric motors" on Grainger Industrial Supply's website (Docket Entry Nos. 180-1, 182-1, 183-2);
- the "hook load (electrical)" listing on the Pars Geo-data' website (Docket Entry Nos. 180-1, 182-1, 183-2);
- a search for "D2-06BDC1-1" on AutomationDirect's website (Docket Entry No. 195-4);
- the "Basic HMI" page on Maple System's website (Docket Entry No. 195-5);
- the "EXG Series Explosion Proof Pressure Transmitter" page on Dylix Corporation's website (Docket Entry No. 195-6);
- the "Model 170/270/370 | WECO 'Hammer' Union Pressure Transmitter" page on GP:50's website (Docket Entry No. 195-7);
- the "GS2-11P0" listing on AutomationDirect's website (Docket Entry No. 195-8);
- "weight values" test results (Docket Entry No. 153-2); and
- Padco marketing materials (Docket Entry Nos. 135-2, 153-3, 157-8, 157-9).

B. The experts

Four witnesses submitted their opinions and reports under Rule 702 of the Federal Rules of Evidence. Michael Stewart and Kenneth Miller testified as Rule 702 witnesses for Auto-Dril, and Michael Porche and Mallik Guggari testified for National Oilwell and Canrig. Each of the Rule 702 witnesses is a person of ordinary skill in the art of automatic drillers used in oil and gas drilling control systems. (Docket Entry Nos. 134-1 at ¶ 2–3, 168-6 at ¶ 7–8, 168-7 at ¶ 7, 174).

i. Michael Stewart

Stewart submitted a declaration, (Docket Entry Nos. 134-1, 142-2, 148-2, 171-3, 175-6, 176-7, 180-4, 182-2), and his deposition, (Docket Entry Nos. 148-1, 153-18, 179-6, 180-2, 182-3, 185-1, 186-1). Stewart received a degree in petroleum engineering from the Colorado School of Mines and has worked in the oil and gas industry since 1984. (Docket Entry No. 134-1 at ¶ 2). He gained expertise "through education and experience in the oil and gas exploration business, including the participation in varying phases, and in a variety of roles in drilling no less than 1400 oil and gas wells." *Id.* at ¶ 1. He has "significant experience in drilling oil and gas wells with rotary rigs," has "been involved with drilling operations using many different types of rigs," and has been "in charge of, or advised on, drilling strategies and methods." *Id.* Stewart also testified about his background in his deposition. (Docket Entry No. 148-1 at 5–7).

ii. Kenneth Miller

Kenneth Miller submitted an expert report, (Docket Entry Nos. 168-1, 171-2, 175-7, 176-4), and his deposition, (Docket Entry Nos. 168-2, 171-6, 176-5, 180-3, 182-4, 185-2, 194-2). Miller studied at the University of Houston but did not receive a degree. (Docket Entry Nos. 167-3 at 4–6, 172-3). He worked at Texas Instruments as an automation engineer between 2003 and 2007, at

Teledrill as a design engineer between 2007 and 2009, and at Edros Miller as president between 2009 and 2017. (Docket Entry No. 171-2 at 16). While at Teledrill, Miller worked on the design, development, and testing of "Measurement While Drilling tools including electronics, firmware and surface software systems." *Id.* As the founding partner of Erdos Miller, he worked in both a technical and business capacity, including "participat[ing] in the design and development of drilling products such as Measurement While Drilling Systems, Automatic Drillers, Mudlogging Systems and other rig control systems as well as downhole tools." *Id.*; (Docket Entry No. 167-3 at 19–23).

The defendants moved to strike Miller's expert report, arguing that he lacked education and work experience to be a person of ordinary skill in the art. (Docket Entry No. 167). Auto-Dril responded and provided a supplement to Miller's report. (Docket Entry Nos. 172, 172-1). The court denied the motion to strike, finding that Miller qualified as a person of ordinary skill in the art and that "[t]he extent to which Miller's experience or education may impact his conclusions can be explored by cross-examination and by presenting contrary evidence." (Docket Entry No. 174 at 7).

iii. Michael Porche

Michael Porche submitted a declaration, (Docket Entry Nos. 168-6, 171-4), and his deposition, (Docket Entry Nos. 168-8, 171-1, 175-3, 176-6, 179-5, 184-2). Porche received a bachelor of science in physics with minors in electrical engineering, mathematics, and economics from Louisiana State University. (Docket Entry No. 171-1 at ¶ 1). He began working for subsidiaries of National Oilwell in 1972, first at Baylor Company, then at Ross Hills Controls. *Id.* Porche worked in the oilfield for over 40 years, holding management roles as a service manager; a general marketing manager for new product development; a customer services manager overseeing field service, customer training, parts, and in-house testing; and a general manager of Baylor's first

overseas office. *Id.* He was an electrician and technician on a large offshore drilling rig, and he has developed and taught classes in eddy-current brake theory, power rectifier and inverters, dynamic positioning, marine engineering propulsion, and control system engineering. *Id.* Porche served on an International Association of Drilling Contractors group for electrical installations on mobile offshore drilling units. *Id.* Porche retired as senior principal engineer for National Oilwell in 2015. *Id.* He has published multiple technical articles and holds patents. *Id.* at ¶¶ 2–3.

In addition to Porche's declaration and his deposition, Auto-Dril relies on Porche's 2016 declaration submitted to the United States Patent and Trademark Office in an *inter partes* review action in which Pason challenged the '172 Patent. (Docket Entry No. 171-1). National Oilwell and Canrig argue that the declaration is inadmissible under the Southern District of Texas local patent rules. (Docket Entry Nos. 180 at 16–17; 182 at 12–13; 183 at 10–11).

Rule 4-2 states as follows:

> **4-2. Exchange of Preliminary Claim Constructions and Extrinsic Evidence.**
>
> **(a)** By the deadline set in the Scheduling Order, the parties must simultaneously exchange a proposed "Preliminary Claim Construction" of each element of each claim term, phrase, or clause in issue. Each "Preliminary Claim Construction" must also identify the structures, acts, or materials corresponding to each claim element governed by 35 U.S.C. § 112, ¶ 6.
>
> **(b)** At the same time the parties exchange their respective "Preliminary Claim Constructions," they must also exchange a preliminary identification of extrinsic evidence they contend supports their respective claim constructions, such as dictionary definitions, citations to learned treatises and prior art, and testimony of fact and expert witnesses. The parties must identify each item of extrinsic evidence by production number or produce a copy of any such item not previously produced. With respect to each fact or expert witness a party intends to rely on for claim construction, the party must also provide a brief description of the substance of that witness's proposed testimony.

Rules of Practice for Patent Cases in the Southern District of Texas (effective Jan. 1, 2008).

The defendants argue that Auto-Dril "was required to produce *all* extrinsic evidence it planned to rely on for claim construction purposes" when it produced its preliminary proposed constructions in the August 2016 exchange. (Docket Entry Nos. 180 at 16; 182 at 12; 183 at 10 (emphasis added)). But Rule 4-2 does not require that parties exchange, in the preliminary claim-construction stages, all extrinsic evidence that they will rely upon. The rule requires a "preliminary identification" of extrinsic evidence. The defendants' interpretation of Rule 4-2 would limit the parties to the extrinsic evidence available when the parties exchanged their preliminary proposed constructions. Under that approach, Auto-Dril could use only the extrinsic evidence it produced on August 15, 2016, more than 15 months before the *Markman* hearing and well before discovery ended. Auto-Dril's reliance on Porche's declaration in the *Pason inter partes* review does not violate Rule 4-2.

The defendants argue that Auto-Dril "further failed to mention it was relying on [Porche's *Pason* declaration] in its: (1) opening claim construction brief filed on December 12, 2016 . . . , and (2) its responsive claim construction brief filed on January 6, 2017 . . . ." (Docket Entry Nos. 180 at 16; 182 at 12; 183 at 10–11). The defendants argue that the declaration should be excluded because "Auto-Dril only informed defendants that it planned to rely on this declaration through its supplemental claim construction brief filed on September 5, 2017." *Id.* (emphasis omitted). This argument is also unpersuasive. Porche adopted his *Pason* declaration as his testimony in this case when he was deposed on May 23, 2017, and the defendants' counsel did not object. (Docket Entry No. 175-3 at 6). Auto-Dril could not have informed the defendants that it would rely on the declaration in its opening or responsive claim construction briefs, which were filed months before Porche was deposed in this case and adopted the *Pason* declaration as his testimony in this case.

Auto-Dril's supplemental claim-construction brief, (Docket Entry No. 171), was the first claim-construction brief that Auto-Dril filed after Porche's deposition. Auto-Dril's disclosure of its reliance on Porche's *Pason* declaration was not late.

The defendants also argue that Porche's *Pason* declaration is inadmissible hearsay. (Docket Entry Nos. 180 at 17, 183 at 11). A statement is not hearsay if it "is offered against an opposing party and . . . is one the party manifested that it adopted or believed to be true." FED. R. EVID. 801(d)(2)(B); *Collins v. Wayne Corp.*, 621 F.2d 777, 782 (5th Cir. 1980), *superseded by rule on other grounds as recognized in Mathis v. Exxon Corp.*, 302 F.3d 448 (5th Cir. 2002) (an expert report was admissible as a party-opponent's statement because the expert "was performing the function that [the party opponent] had employed him to perform"). Porche adopted his *Pason* declaration after he was retained as an expert for one of the defendants in this case. As noted, the defendants did not object when Porche adopted the *Pason* declaration as his testimony in this case, and the defendants had a full opportunity to examine Porche on the declaration during his deposition. *Cf.* FED. R. EVID. 804(b)(1). Porche's *Pason* declaration is admissible under Rule 801(d)(2)(B).

The defendants finally argue that the *Pason* declaration is irrelevant because Porche was not asked to provide an opinion on indefiniteness issues. (Docket Entry Nos. 180 at 18; 182 at 13; 183 at 12). Porche's *Pason* declaration is relevant under Rule 401 of the Federal Rules of Evidence. Porche analyzed the '172 Patent in his *Pason* declaration and offered his opinion as a person of ordinary skill in the art on the construction of many of the claim terms disputed in this case. (Docket Entry No. 176-3).

iv. Mallik Guggari

Mallik Guggari submitted his declaration, (Docket Entry Nos. 168-7, 171-5, 179-2, 183-1), and deposition, (Docket Entry No. 168-9). Guggari received a bachelor of engineering in electrical engineering from Karnatak University, a master of science in electrical engineering from Texas A&M University, and a master of business administration from the McCombs School of Business at the University of Texas at Austin . (Docket Entry No. 168-7). He began working in the oilfield in 1989 as a development and senior development engineer for Ross Hill Controls Corporation. *Id.* Guggariwas a senior controls engineer, principal engineer, and research and development manager for MD Totco, a division of National Oilwell. *Id.* He was a senior manager of new product development for IMO, a division of National Oilwell, and then worked in National Oilwell's dynamic drilling solutions unit as a global automation engineering and system validation lead. *Id.* Guggari most recently served as founder and chief executive officer of GK Plus Innovations, LLC. *Id.* He has published multiple technical articles and holds patents. *Id.*

III. The Legal Standards

A. Claim construction

The "claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). "[T]he construction of a patent, including terms of art within its claim, is exclusively within the province of the court." *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996). Claim terms are "generally given their ordinary and customary meaning," defined as "the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention." *Phillips*, 415 F.3d at 1312–13 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582

(Fed. Cir. 1996)). That is a person who will "read the words used in the patent documents with an understanding of their meaning in the field, and [has] knowledge of any special meaning and usage in the field." *Id.* (quoting *Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998)); *see also Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1319 (Fed. Cir. 2005) (cautioning courts not to interpret claim terms "in a vacuum" (quotation omitted)).

Claim construction begins with the claim language. *Aptalis Pharmatech, Inc. v. Apotex Inc.*, 2018 WL 286123, at *3 (Fed. Cir. Jan. 4, 2018). The court looks first "to the words of the claims themselves, both asserted and nonasserted, to define the scope of the patented invention," *Vitronics*, 90 F.3d at 1582, and construes the claim terms in the context of the surrounding claim language. *ACTV, Inc. v. Walt Disney Co.*, 346 F.3d 1082, 1088 (Fed. Cir. 2003) ("[T]he context of the surrounding words of the claim also must be considered in determining the ordinary and customary meaning of those terms."); *accord Lexion Medical, LLC v. Northgate Techs., Inc.*, 641 F.3d 1352, 1356 (Fed. Cir. 2011). When the words in the context of the surrounding claim language make the ordinary meaning readily apparent, claim construction "involves little more than the application of the widely accepted meaning of commonly understood words." *Phillips*, 415 F.3d at 1314.

Patent-ese is a notoriously clumsy and awkward form of English, which can make construction more challenging. If the "ordinary and customary" meaning is unclear, the court moves from the words in the claims, viewed in context of the patent, to "the intrinsic evidence of record, i.e., the patent itself, including the claims, the specification and, if in evidence, the prosecution history." *Vitronics*, 90 F.3d at 1582. Courts review the "specification to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning." *Vitronics*, 90 F.3d at 1582. The Federal Circuit has repeatedly stated that "claims 'must be read in view of the

specification, of which they are a part.'" *Phillips*, 415 F.3d at 1315 (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996)). The specification, a "concordance for the claims," *id.* (quoting *Autogiro Co. of Am. v. United States*, 384 F.2d 391, 397–98 (Ct. Cl. 1967)), is the "best source for understanding a technical term," *id.* (quoting *Multiform Desiccants*, 133 F.3d at 1478).[3] "[T]he specification may reveal an intentional disclaimer, or disavowal, of claim scope by the inventor." *Id.* (citing *Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1343–44 (Fed. Cir. 2001)); *see also Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (claim construction may deviate from the ordinary and customary meaning of a disputed term only if (1) a patentee sets out a definition and acts as his own lexicographer, or (2) the patentee disavows the full scope of a claim term, either in the specification or during prosecution).

"The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Phillips*, 415 F.3d at 1316 (quoting *Renishaw PLC v. Marposs Società per Azioni*, 158 F.3d, 1243, 1250 (Fed. Cir. 1998)). "There is a fine line between construing the claims in light of the specification and improperly importing a limitation from the specification into the claims." *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1305 (Fed. Cir. 2011). Courts must "capture the scope of the actual invention, rather than strictly limit the scope of claims to disclosed embodiments or allow the claim language to become divorced from what the specification conveys is the invention."

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[3] *See also Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1360 (Fed. Cir. 2004) ("In most cases, the best source for discerning the proper context of claim terms is the patent specification wherein the patent applicant describes the invention."). When the specification "reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess . . . the inventor's lexicography governs." *Phillips*, 415 F.3d at 1316 (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)).

Id.

"[A] court 'should also consider the patent's prosecution history, if it is in evidence.'" *Phillips*, 415 F.3d at 1317 (quoting *Markman*, 52 F.3d at 980); *see also Typhoon Touch Techs., Inc. v. Dell, Inc.*, 659 F.3d 1376, 1381 (Fed. Cir. 2011) ("[T]he specification is the primary source for determining what was invented and what is covered by the claims, elucidated if needed by the prosecution history."). The prosecution history "can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." *Phillips*, 415 F.3d at 1317 (citing *Vitronics*, 90 F.3d at 1582–83). The prosecution history includes "all express representations made by or on behalf of the applicant to the examiner to induce a patent grant, or . . . to reissue a patent . . . includ[ing] amendments to the claims and arguments made to convince the examiner that the claimed invention meets the statutory requirements of novelty, utility, and nonobviousness." *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 452 (Fed. Cir. 1985); *see also Sanofi-Aventis Deutschland GmbH v. Genentech, Inc.*, 473 F. App'x 885, 888 (Fed. Cir. 2012) ("We have held that an otherwise broadly defined term can be narrowed during prosecution through arguments made to distinguish prior art.") (citing *Phillips*, 415 F.3d at 1317 ("The prosecution history . . . consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent.")).

"The doctrine of prosecution disclaimer is well established in Supreme Court precedent, precluding patentees from recapturing through claim interpretation specific meanings disclaimed during prosecution." *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003); *see also SanDisk Corp. v. Memorex Prods., Inc.*, 415 F.3d 1278, 1286 (Fed. Cir. 2005). The doctrine

applies even if the disclaimers were not necessary to make the invention patentable. *See Uship Intellectual Props., LLC v. United States*, 714 F.3d 1311, 1315 (Fed. Cir. 2013) ("We find no support for [the] proposition that prosecution disclaimer applies only when applicants attempt to overcome a claim rejection. Our cases broadly state that an applicant's statements to the PTO characterizing its invention may give rise to a prosecution disclaimer."); *cf. Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1583 (Fed. Cir. 1995) ("Estoppel extends beyond the basis of patentability. . . . Clear assertions made during prosecution in support of patentability, whether or not actually required to secure allowance of the claim, may also create an estoppel.") (citing *Tex. Instruments, Inc. v. U.S. Int'l Trade Comm'n*, 988 F.2d 1165 (Fed. Cir. 1993)).[4] Prosecution disclaimer does not apply "where the alleged disavowal of claim scope is ambiguous." *Omega Eng'g*, 334 F.3d at 1324; *see also id.* at 1325 ("[W]e have required the alleged disavowing statements to be both so clear as to show reasonable clarity and deliberateness and so unmistakable as to be unambiguous evidence of disclaimer.") (citations omitted). Only when "the patentee has

[4] "There is a clear line of distinction between using the contents of the prosecution history to reach an understanding about disputed claim language and the doctrine of prosecution history estoppel which 'estops' or limits later expansion of the protection accorded by the claim to the patent owner under the doctrine of equivalents when the claims have been purposefully amended or distinguished over relevant prior art to give up scope. . . . [T]he two uses of the prosecution history must not be confused." *Biodex Corp. v. Loredan Biomedical, Inc.*, 946 F.2d 850, 862 (Fed. Cir. 1991) (citations and internal quotation marks omitted); *see also Ballard Med. Prods. v. Allegiance Healthcare Corp.*, 268 F.3d 1352, 1358–59 (Fed. Cir. 2001) (distinguishing the two); *Spectrum Int'l Corp. v. Sterilite Corp.*, 164 F.3d 1372, 1378 n.2 (Fed. Cir. 1998) (same). "Just as prosecution history estoppel may act to estop an equivalence argument under the doctrine of equivalents, positions taken before the PTO may bar an inconsistent position on claim construction." *Ballard Med. Prods.*, 268 F.3d at 1359 (quoting *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1457 (Fed. Cir. 1998)) (alteration omitted). When the accused infringer argues that the prosecution history results in a narrowing of a claim's scope, there is no difference, and the Federal Circuit has refused to reverse based on references to estoppel. *See id.* at 1359 ("Because the substance of the district court's analysis was sound, we disregard the fact that the court used the term 'prosecution history estoppel' in an unconventional manner."); *Biodex Corp.*, 946 F.2d at 862–63 (observing that "Biodex is technically correct in asserting that the doctrine of prosecution history estoppel is 'irrelevant' to determination of literal claim scope" but upholding the district court because prosecution history is relevant to claim interpretation) (citation omitted).

unequivocally disavowed a certain meaning to obtain his patent [does] the doctrine of prosecution disclaimer attach[ ] and narrow[ ] the ordinary meaning of the claim congruent with the scope of the surrender." *Id.* at 1324.

Courts may also "rely on extrinsic evidence, which 'consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.'" *Phillips*, 415 F.3d at 1317 (quoting *Markman*, 52 F.3d at 980). Although extrinsic evidence "'can shed useful light on the relevant art,' it is 'less significant than the intrinsic record in determining the legally operative meaning of claim language.'" *Zircon Corp. v. Stanley Black & Decker, Inc.*, 452 F. App'x 966, 972–73 (Fed. Cir. 2011) (quoting *Phillips*, 415 F.3d at 1317). Extrinsic evidence is "in general . . . less reliable than the patent and its prosecution history" because it is "not part of the patent" and was not created in patent prosecution: "extrinsic publications may not be written by or for skilled artisans"; and expert reports and testimony created later, for litigation, may "suffer from bias not present in intrinsic evidence." *Phillips*, 415 F.3d at 1318. A court must use "sound discretion" in admitting and using extrinsic evidence. *Id.* at 1319; *see also Seattle Box Co. v. Indus. Crating & Packing, Inc.*, 731 F.2d 818, 826 (Fed. Cir. 1984) ("A trial judge has sole discretion to decide whether or not [s]he needs, or even just desires, an expert's assistance to understand a patent. We will not disturb that discretionary decision except in the clearest case.").

"[E]xtrinsic evidence may be useful to the court, but it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence." *Phillips*, 415 F.3d at 1319. Although a court may consider extrinsic evidence, it must not relegate the intrinsic evidence to a mere "check on the dictionary meaning of a claim term." *Id.* at 1320–21 (noting that relying on dictionaries "too often" causes "the adoption of a dictionary definition

entirely divorced from the context of the written description"). "The sequence of steps used by the judge in consulting various sources is not important; what matters is for the court to attach the appropriate weight to be assigned to those sources in light of the statutes and policies that inform patent law." *Id.* at 1324 (citing *Vitronics*, 90 F.3d at 1582).

These claim-construction rules must be applied to the record in this case, including the tutorial counsel jointly provided the court, the arguments counsel presented during the *Markman* hearing, the expert reports, and the documents admitted into evidence.

B. Indefiniteness

Section 112(2) provides that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. § 112(2). "The primary purpose of the definiteness requirement is to ensure that the claims are written in such a way that they give notice to the public of the extent of the legal protection afforded by the patent, so that interested members of the public, e.g., competitors of the patent owner, can determine whether or not they infringe. That determination requires a construction of the claims according to the familiar canons of claim construction." *Oakley, Inc. v. Sunglass Hut Int'l*, 316 F.3d 1331, 1340 (Fed. Cir. 2003) (citing *All Dental Prodx, LLC v. Advantage Dental Prods.*, 309 F.3d 774, 779–80 (Fed. Cir. 2002) (citations omitted)). "One of those canons is that claims are construed as one skilled in the art would understand them in light of the specification of which they are a part." *Id*. at 1340–41 (citing *Orthokinetics, Inc. v. Safety Travel Chairs, Inc*., 806 F.2d 1565, 1575 (Fed. Cir. 1986)).

If an applicant uses means-plus-function language in a claim under § 112(6), he "must set forth in the specification an adequate disclosure showing what is meant by that language. If an

applicant fails to set forth an adequate disclosure, the applicant has in effect failed to particularly point out and distinctly claim the invention as required by the second paragraph of section 112." *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1338 (Fed. Cir. 2008) (quoting *In Re Donaldson Co.*, 16 F.3d 1189, 1195 (Fed. Cir. 1994) (en banc)). If a claim includes a means-plus-function limitation, failure to disclose adequate structure corresponding to the claimed function results in invalidity for indefiniteness. *In re Dossel*, 115 F.3d 942, 946 (Fed. Cir. 1997); s*ee also Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369, 1376 (Fed. Cir. 2001) ("For a court to hold that a claim containing a means-plus-function limitation lacks a disclosure of structure in the patent specification that performs the claimed function, necessarily means that the court finds the claim in question indefinite, and thus invalid."); *Cardiac Pacemakers, Inc. v. St. Jude Med. Inc.*, 296 F.3d 1106, 1114 (Fed Cir. 2002); *Techs. Australia PTY Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1331 (Fed. Cir. 2008).

An issued patent comes with a statutory presumption of validity under 35 U.S.C. § 282. "[A]n alleged infringer who raises invalidity as an affirmative defense has the ultimate burden of persuasion to prove invalidity by clear and convincing evidence, as well as the initial burden of going forward with evidence to support its invalidity allegation." *Titan Tire Corp. v. Case New Holland, Inc.*, 566 F.3d 1372, 1376 (Fed. Cir. 2009) (citing *Tech. Licensing Corp.*, 545 F.3d at 1327). "Thus, a challenge to a claim containing a means-plus-function limitation as lacking structural support requires a finding, by clear and convincing evidence, that the specification lacks disclosure of structure sufficient to be understood by one skilled in the art as being adequate to perform the recited function." *Budde*, 250 F.3d at 1376–77.

A determination of claim indefiniteness is a legal conclusion reached by the court

performing its duty as the "construer of patent claims." *Tech. Licencing Corp*., 545 F.3d at 1338 (citing *Personalized Media Commc'ns, LLC v. Int'l Trade Comm'n*, 161 F.3d 696, 705 (Fed. Cir. 1998)). "To the extent there are any factual findings upon which a trial court's indefiniteness conclusion depends, they must be proven by the challenger by clear and convincing evidence." *Id.* (citing *Intel Corp. v. VIA Techs., Inc*., 319 F.3d 1357, 1366 (Fed. Cir. 2003)).

C. Means-plus-function claims

Section 112(6) provides that "[a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. § 112(6). A means-plus-function claim format allows a patentee to "describe an element of his invention by the result accomplished or the function served, rather than describing the item or element to be used." *Warner-Jenkinson Co. v. Hilton Davis Chem. Co*., 520 U.S. 17, 27 (1997). A patentee's use of the word "means" in a claim element that recites a function creates a presumption that the element is drafted in means-plus-function format. *Id.*; *TriMed, Inc. v. Stryker Corp*., 514 F.3d 1256, 1259 (Fed. Cir. 2008). This presumption can be rebutted if the claim itself recites sufficient structure to accomplish the functions identified in the claim. *Welker Bearing Co. v. PHD, Inc*., 550 F.3d 1090, 1096 (Fed. Cir. 2008); *Lighting World, Inc. v. Birchwood Lighting, Inc*., 382 F.2d 1354, 1360 (Fed. Cir. 2004).

"Sufficient structure exists when the claim language specifies the exact structure that performs the functions in question without need to resort to other portions of the specification or extrinsic evidence for an adequate understanding of the structure." *TriMed*, 514 F.3d at 1259–1260.

A claim may recite sufficiently definite structure if it has "an understood meaning in the art" that connotes enough structure to fall outside section 112, ¶ 6 or if it is "'used in common parlance or by persons of skill in the pertinent art to designate structure, even if the term covers a broad class of structures.'" *Aspex Eyewear, Inc. v. Altair Eyewear, Inc.*, 288 F. App'x 697, 703 (Fed. Cir. 2008) (quoting *Lighting World*, 382 F.3d at 1359–1360)).

If means-plus-function analysis applies, a court must first determine what the claimed function is and then determine the corresponding structures disclosed in the specification that perform that function. *Welker Bearing*, 550 F.3d at 1097; *Minks v. Polaris Indus., Inc.*, 546 F.3d 1364, 1377 (Fed. Cir. 2008); *Texas Digital Sys., Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1208 (Fed. Cir. 2002). Whether the written description adequately sets forth structure corresponding to the claimed function must be considered from the perspective of a person skilled in the art. *Intel Corp.*, 319 F.3d at 1365–66 (citing *Budde*, 250 F.3d at 1376). The question is not whether one of skill in the art would be capable of implementing a structure to perform the function, but whether that person would understand the written description itself to disclose such a structure. *Biomedino, LLC v. Waters Techs. Corp.*, 490 F.3d 946, 953 (Fed. Cir. 2007) (citing *Med. Instr. & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1212 (Fed. Cir. 2003)).

The Federal Circuit has made it clear that disclosing a general purpose computer capable of running specialized software, without more, does not supply sufficient structure for means-plus-function claims involving a computer that must be specially programmed to perform a specific set of functions. *See WMS Gaming, Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999). The structure that the specification must disclose is "not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm." *Id.*; *see also Harris*

*Corp. v. Ericsso*n, *Inc*., 417 F.3d 1241, 1253 (Fed. Cir. 2005) ("A computer-implemented means-plus-function term is limited to the corresponding structure disclosed in the specification and equivalents thereof, and the corresponding structure is the algorithm."); *Gobeli Research ltd. v. Apple Computer, In*c., 384 F. Supp. 2d 1016, 1022 (E.D. Tex. 2005) ("The Federal Circuit has made clear that when software is linked to the disclosed function, the structure for performing the function is limited to the algorithm disclosed in the specification.") (citing *WMS Gamin*g, 184 F.3d at 1348–49*; Harris*, 417 F.3d at 1253).

The Federal Circuit does not impose a "lofty standard" for the disclosure required to avoid indefiniteness for means-plus-function claims involving computers that must be specially programmed to perform the recited functions. *Brown v. Baylor Health Care Sys.*, 662 F. Supp. 2d 669 (S.D. Tex. 2009), *aff'd sub nom. Brown v. Baylor Healthcare Sys.*, 381 F. App'x 981 (Fed. Cir. 2010). A patentee may express an algorithm "in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure." *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1340 (Fed. Cir. 2008).

D. Summary judgment under Rule 56

"Summary judgment is appropriate only if 'there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law.'" *Vann v. City of Southaven, Miss.*, 884 F.3d 307, 309 (5th Cir. 2018) (citations omitted); see also FED. R. CIV. P. 56(a). "A genuine dispute of material fact exists when the 'evidence is such that a reasonable jury could return a verdict for the nonmoving party.'" *Burrell v. Prudential Ins. Co. of Am.*, 820 F.3d 132, 136 (5th Cir. 2016) (quoting *Anderson v. Liberty Lobby*, 477 U.S. 242, 248 (1986)). "The moving party 'bears the initial responsibility of informing the district court of the basis for its motion, and identifying

those portions of [the record] which it believes demonstrate the absence of a genuine issue of material fact.'" *Brandon v. Sage Corp.*, 808 F.3d 266, 269-70 (5th Cir. 2015) (quoting *Celotex Corp. v. Catrett*, 477 U.S. 317, 323 (1986)).

"Where the non-movant bears the burden of proof at trial, 'the movant may merely point to the absence of evidence and thereby shift to the non-movant the burden of demonstrating . . . that there is an issue of material fact warranting trial.'" *Kim v. Hospira, Inc.*, 709 Fed. App'x 287, 288 (5th Cir. 2018) (quoting *Nola Spice Designs, L.L.C. v. Haydel Enters.*, Inc., 783 F.3d 527, 536 (5th Cir. 2015)). While the party moving for summary judgment must demonstrate the absence of a genuine issue of material fact, it does not need to negate the elements of the nonmovant's case. *Austin v. Kroger Tex., L.P.*, 864 F.3d 326, 335 (5th Cir. 2017) (quoting *Little v. Liquid Air Corp.*, 37 F.3d 1069, 1076 n. 16 (5th Cir. 1994)). A fact is material if "its resolution could affect the outcome of the actions." *Aly v. City of Lake Jackson*, 605 Fed. App'x 260, 262 (5th Cir. 2015) (citing *Burrell v. Dr. Pepper/Seven UP Bottling Grp., Inc.*, 482 F.3d 408, 411 (5th Cir. 2007)). "If the moving party fails to meet [its] initial burden, the motion [for summary judgment] must be denied, regardless of the nonmovant's response." *Pioneer Exploration, LLC v. Steadfast Ins. Co.*, 767 F.3d 503 (5th Cir. 2014).

"When the moving party has met its Rule 56(c) burden, the nonmoving party cannot survive a summary judgment motion by resting on the mere allegations of its pleadings." *Bailey v. E. Baton Rouge Parish Prison*, 663 Fed. App'x 328, 331 (5th Cir. 2016) (quoting *Duffie v. United States*, 600 F.3d 362, 371 (5th Cir. 2010)). The nonmovant must identify specific evidence in the record and articulate how that evidence supports that party's claim. *Willis v. Cleco Corp.*, 749 F.3d 314, 317 (5th Cir. 2014). "This burden will not be satisfied by 'some metaphysical doubt as to the material

facts, by conclusory allegations, by unsubstantiated assertions, or by only a scintilla of evidence.'" *Jurach v. Safety Vision, LLC*, 642 Fed. App'x 313, 317 (5th Cir. 2016) (quoting *Boudreaux v. Swift Transp. Co.*, 402 F.3d 536, 540 (5th Cir. 2005)). In deciding a summary judgment motion, the court draws all reasonable inferences in the light most favorable to the nonmoving party. *Darden v. City of Fort Worth*, 866 F.3d 698, 702 (5th Cir. 2017).

III. The Claim-Construction Analysis

A. Auto-Dril's proposed amended claim constructions

The defendants object to considering Auto-Dril's amended proposed claim-constructions, (Docket Entry No. 171-2), arguing that this court's local patent rules "were enacted to prevent this type of 'shifting sands' approach to claim construction," and that some proposed changes "contradicts[] Auto-Dril's prior assertions and admissions" about certain terms. (Docket Entry Nos. 180 at 7, 183 at 4, 8–10; Docket Entry No. 182 at 6 (citing *Goodman v. Smart Modular Techs., Inc.*, CV H-14-1380, 2015 WL 12777374, at *2 (S.D. Tex. June 4, 2015)).

When the parties asked for a *Markman* hearing, they filed a joint claim-construction chart with their proposed consturctions. (Docket Entry No. 150). A little more than seven months later, Auto-Dril submitted a proposed amended joint claim-construction chart as an exhibit to its supplemental brief. (Docket Entry No. 171-22). Auto-Dril's constructions of disputed terms in this chart differed from the original chart; the defendants' constructions were unchanged.

Auto-Dril argues that it amended its constructions based on additional discovery and that its recent chart reflects its "most informed, up-to-date, legally correct construction proposals." (Docket Entry Nos. 171 at 5, 188 at 62–63). Auto-Dril notes that the Federal Circuit has allowed a district court to engage in "rolling claim construction, in which the court revisits and alters its interpretation

of the claim terms as its understanding of the technology evolves." *Pressure Prod. Med. Supplies, Inc. v. Greatbatch Ltd.*, 599 F.3d 1308, 1316 (Fed. Cir. 2010) ("a trial judge may learn more about the technology during the trial that necessitates some clarification of claim terms before the jury deliberates"); *Conoco, Inc. v. Energy & Envtl. Int'l, L.C.*, 460 F.3d 1349, 1359 (Fed. Cir. 2006).

Though Auto-Dril amended some of its constructions after the parties filed their joint claim-construction chart, it did so in early September 2017. (Docket Entry No. 171-2). The defendants had nearly three months to prepare their response to Auto-Dril's amended claim constructions before the November 28 *Markman* hearing. The defendants did not ask to supplement their own constructions to respond to Auto-Dril's amended constructions. The *Markman* hearing provided the defendants with ample opportunity to respond to those constructions. The defendants are not prejudiced by this court's consideration of Auto-Dril's amended claim constructions. The objection is overruled.

B. Construing "drill stem"

i. The parties' contentions

Auto-Dril argues that "drill stem" does not need construction. (Docket Entry No. 171-22 at 2). Alternatively, it argues that the claim term refers to a "connected set of drill pipe and drill collars." The defendants assert that "drill stem" means a drill string plus the kelly. (Docket Entry No. 135 at 26). A kelly or kelly drive is a well-drilling device on an oil or gas drilling rig. The *Schlumberger Oilfield Glossary* defines it as a "long square or hexagonal steel bar with a hole drilled through the middle for a fluid path. The kelly is used to transmit rotary motion from the rotary table or kelly bushing to the drillstring, while allowing the drillstring to be lowered or raised during rotation." *Kelly*, SCHLUMBERGER OILFIELD GLOSSARY (accessed April 6, 2018),

http://www.glossary.oilfield.slb.com/. In its amended construction chart, Auto-Dril argues that "drill stem" and "drill string" are interchangeable, and that no evidence has been offered to show that a "drill stem" or "drill string" requires a kelly. (Docket Entry No. 134 at 6).

Auto-Dril cites the *Schlumberger Oilfield Glossary*, which lists "drill string" as a synonym for "drillstem." *Drillstem*, SCHLUMBERGER OILFIELD GLOSSARY. The definition for both in the 2018 *Glossary* is "[t]he combination of the drillpipe, the bottomhole assembly and any other tools used to make the drill bit turn at the bottom of the wellbore." *Id.* Auto-Dril asserts that "system" in "said drill system" is a typographical error, and that the term should read "said drill stem." (Docket Entry No. 134 at 6; Column 8, line 30). The defendants do not dispute that "drill system" should read "drill stem."

The defendants argue that "drill stem" and "drill string" are not interchangeable, citing the presumption that "the use of these different terms in the claims connotes different meanings." *CAE Screenplates Inc. v. Heinrich Fiedler GmbH & Co. KG*, 224 F.3d 1308, 1317 (Fed. Cir. 2000). The defendants argue that reliance on the *Schlumberger Oilfield Glossary* and expert declarations are improper because they use the 2016 definition of "drill stem," as opposed to the definition "publicly available at the time the patent [was] issued." *Texas Digital Sys., Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1202–03 (Fed. Cir. 2002). The defendants cite the 2005 edition of *A Dictionary for the Oil and Gas Industry*. (Docket Entry No. 137-1 at 4).

ii. Analysis

Both parties rely on dictionaries. Auto-Dril's cited dictionary definitions of "drillstem" and "drill string" are the same. *Drillstem, Drill String*, SCHLUMBERGER OILFIELD GLOSSARY. Stewart and Porche both testified that a person of ordinary skill in the art would know that "drill string" and

"drill stem" describe the same feature. (Docket Entry Nos. 134-1 at ¶ 19, 171-1 at ¶ 11). In 2005, *A Dictionary for the Oil and Gas Industry* defined "drill stem" as "all members in the assembly used for rotary drilling from the swivel to the bit, including the kelly, the drill pipe and tool joints, the drill collars, the stabilizers and various speciality items. 'Drill string' is a synonym." (Docket Entry No. 137-1 at 4). The court agrees that "drill string" and "drill stem" are synonymous and interchangeable.

The problem with Auto-Dril's proposed construction is the evidence that the *Schlumberger Oilfield Glossary* definition of "drill stem" and "drill string" has changed over time as the technology has changed. Stewart testified that it is common for industry technology and terminology to change over time. Many rigs had "kellies" in the early- to mid-2000s, when the '172 Patent was filed, and in 2006, when it issued; today, by contrast, only a minority of rigs use kellies. (Docket Entry No. 148-1 at 25). The *Schlumberger* definition was published in 2005, the year before the '172 Patent issued, and defined "drill stem" to include the kelly.

"When a patent is granted, prosecution is concluded, the intrinsic record is fixed, and the public is placed on notice of its allowed claims. Dictionaries, encyclopedias and treatises, publicly available at the time the patent is issued, are objective resources that serve as reliable sources of information on the established meanings that would have been attributed to the terms of the claims by those of skill in the art." *Texas Digital Sys.*, 308 F.3d at 1202–03.

"Drill stem" is construed to mean "all members in the assembly used for rotary drilling from the swivel to the bit, including the kelly and the drill string."

C. Construing "alternatively move said stem upward and downward," "in said upward or downward direction," and "moving said braking means at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation"

i. The parties' contentions

Auto-Dril argues that the three "upward" and "downward" terms do not need construction. (Docket Entry No. 171-22 at 2, 6, 13). Alternatively, it argues that "alternatively move said stem upward and downward" means "increasing or decreasing the relative speed that the drill stem is inserted into a well bore," and that "in said upward or downward direction" means "in the alternative, describing movement in an upward or downward direction." In its amended construction chart, Auto-Dril adds that the construction is "[u]ndisputed to the extent that experts on both sides agree that control of relative speed results in upward and downward motion of the drill stem/string."

The defendants argue that the first two claim terms mean "capable of moving the drill [string/stem] upward and downward during drilling," and that "moving said braking means at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation" means "capable of moving the braking means to control the downward and upward movement of the drill string." *Id.*

Auto-Dril states that it is willing to accept the defendants' construction if the words "capable of" is removed. Auto-Dril argues that including "capable of" inserts a new claim limitation by converting actions into descriptions of things that cause movement. (Docket Entry No. 134 at 7). The defendants respond that "capable of" is proper because these are apparatus claims, "which require an interpretation of what functions the 'things' must be capable of performing." (Docket Entry No. 141 at 13).

ii. Analysis

"[A]pparatus claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990). The defendants are correct that these

are apparatus claims. Claim 1 describes"[a]n automatic drilling system," which is an apparatus, not a method. (Column 8, line 26). Claim 3 describes "[a] control system for governing drawworks braking in an earth drilling apparatus," again, an apparatus, not a method. (Column 8, lines 55–56). The "upward" and "downward" claim terms "do[] not refer to actions to be taken by the user," but instead "recite[] the capabilities of the apparatus"—the ability to move the drill stem upward and downward. *WesternGeco L.L.C. v. ION Geophysical Corp.*, 876 F. Supp. 2d 857, 874 (S.D. Tex. 2012); *cf. Tech. Properties Ltd. v. Matsushita Elec. Indus. Co.*, 514 F. Supp. 2d 916, 924 (E.D. Tex. 2007), *aff'd sub nom. Tech. Properties Ltd., Inc. v. Arm, Ltd.*, 276 F. App'x 1019 (Fed. Cir. 2008) (a claim term that includes "a method for providing instructions and operands" language is a method claim).

Including "capable of" is proper. It makes clear that the claim terms are not describing method steps. *Microprocessor Enhancement Corp. v. Texas Instruments Inc.*, 520 F.3d 1367, 1375 (Fed. Cir. 2008) (a claim that used functional language was not indefinite because it was "clearly limited to a[n apparatus] possessing the recited structure and *capable* of performing the recited functions"); *Synqor, Inc. v. Artesyn Techs., Inc.*, 2010 WL 2991037, at *31 (E.D. Tex. July 26, 2010), *aff'd*, 709 F.3d 1365 (Fed. Cir. 2013) (language "used to describe the structure and capabilities of the claimed apparatus" is proper).

"Alternatively move said stem upward and downward" is construed to mean "capable of moving the drill stem upward and downward during drilling."

"In said upward or downward direction" is construed to mean "capable of moving the drill string upward and downward during drilling."

"Moving said braking means at proportional rates for controlling weight-on-bit upwardly or

downwardly during a drilling operation" is construed to mean "capable of moving the braking means to control the downward and upward movement of the drill string."

D. Construing "a bit weight sensor" and "sensor means"

i. The parties' contentions

The claim terms "bit weight sensor" and "sensor means" are related, and Auto-Dril combines them in its third motion for partial summary judgment, asserting that the terms are not indefinite under § 112(2). (Docket Entry No. 179). Auto-Dril argues that "a bit weight sensor" means:

> A sensor that electromechanically produces signals that are proportional to weight suspended by a cable or other supporting structure with which such apparatus is engaged and that: (1) is configured to be held in contact with a weight-bearing object that is at least part of an assemblage of objects from which a drilling bit is suspended; and (2) is electrically connectable with a signal input port of a computational device.

(Docket Entry No. 171-22 at 3). The defendants argue that this claim term means "[e]ither one of two constructions both of which render the claim terms indefinite":

> 1. A sensor including a hydraulic transducer bit weight sensor and an electronic bit weight sensor strain gage. If this construction is adopted, this claim term is indefinite because Auto-Dril stipulated that a hydraulic transducer is not part of the claims [(Docket Entry No. 109)].
>
> 2. A sensor limited to an electronic strain gage sensor and invalid for failing the written description requirements of 35 U.S.C. §, [sic] ¶ 1 because no electronic sensor is disclosed.

Id.

Auto-Dril argues that "sensor means" has a function of "measuring weight on bit for said drill string directly through interfacing with bit support means and sending corresponding electric signal to a computational device through signal input means." Auto-Dril argues that the structure is disclosed at Figures 1, 3A, and 3B, and at Column 5, lines 4–52 and lines 25–35, and equivalents. *Id.* at 8. The defendants argue that this term is indefinite for the same reasons that it argues "bit weight sensor" is indefinite. If the term is limited to hydraulic pressure transducers, Auto-Dril

excluded this type of sensor by stipulation. If the term is limited to an electronic strain gage sensor, it is indefinite for failure to disclose the structure in the specification. *Id.*

ii. The construction analysis

The first question is what type of sensors are disclosed in the '172 Patent. The claims do not specify whether the sensors are electronic or hydraulic. The specifications state only that the sensor "may be any one of a number of commercially available sensors." (Column 5, lines 9–11).

The expert testimony is conflicting. Stewart, Auto-Dril's expert, stated "'sensor means' is limited to a direct electronic sensor, such as an electronic strain gauge or electronic tension meter." (Docket Entry No. 134-1 at ¶ 29). He contrasted electronic sensors with hydraulic transducers, which "'sense' a strain on the deadline" hydraulically. *Id.*

Auto-Dril argues that Stewart's declaration refers to both electronic and hydraulic sensors because he stated that the appropriate structure for "sensor means" could be "any one of a number of commercially available" sensors. *Id.*; (Docket Entry No. 186 at 5). But Stewart limited the structure to "commercially available direct *electronic* sensors." (Docket Entry No. 134-1 at ¶ 29 (emphasis added)). Stewart also stated that "the sensor arrangement described in the '172 Patent would at least *include* electronic linkages, and certainly would not be limited to hydraulic sensors (one of the very prior art weaknesses that Mr. Ray's invention eliminated)." *Id.* at ¶ 24. Guggari, the defendants' expert, stated that "[n]owhere in the '172 patent is an electronic strain gage [sic] disclosed or even a description of how an electronic strain gage [sic] senses bit weight. All of the sensors identified in the '172 patent are hydraulic transducers." (Docket Entry No. 171-5 at ¶ 5). Porche stated in his declaration submitted in the *Pason inter partes* review that "[a] POSITA would understand [that] any one of a number of commercially available sensors . . . discloses the

appropriate structure for 'sensor means.'" (Docket Entry No. 171-1 at ¶ 23).

The expert testimony does not provide a unified construction of the sensor terms as a person or ordinary skill in the art would understand them. "When legal 'experts' offer their conflicting views of how the patent should be construed, or where the legal expert's view of how the patent should be construed conflicts with the patent document itself, such conflict does not create a question of fact nor can the expert opinion bind the court or relieve the court of its obligation to construe the claims according to the tenor of the patent." *Markman*, 52 F.3d at 983. The claim language and the specification do not limit the type of sensor to either hydraulic or electronic. The specification instead refers to "one of a number of commercially available sensors," which refers to either sensor type, hydraulic or electric. (Column 5, lines 9–11).

"A bit weight sensor" is construed to mean "a sensor, including a hydraulic bit weight sensor and an electronic bit weight sensor."

"Sensor means" is a means-plus-function claim element governed by § 112(6). Its function is to "measure weight-on-bit of said drill string configured for measuring bit weight directly through interface with bit support means which, at least in part, supports the weight of said drill bit, and generate an electronic signal proportionate to measured weight-on-bit during a drilling operation." Its sufficiently disclosed structure is "a sensor, including a hydraulic bit weight sensor and an electronic bit weight sensor" and its equivalents.

iii. The summary judgment analysis

The second issue is whether Auto-Dril excluded hydraulic pressure transducer sensors from the claims by stipulation. If so, then the claim terms are indefinite for failure to "afford clear notice of what is claimed." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014).

The parties stipulated that: "1. Automatic drilling systems including, but not limited to Canrig's DrillSmart products and NOV's e-Wildcat products, that are controlled and/or directed by weight-on-bit (WOB) measured and/or sensed only through hydraulic-coupled pressure transducer sensors do not infringe any claim of Auto-Dril's U.S. Patent No. 6,994,172." (Docket Entry No. 109). Auto-Dril argues that the exclusion applies only to "sensors (of whatever form, having whatever components) that are connected ('coupled') to the remaining automatic drilling system 'only' via hydraulic means–such as a hydraulic hose." (Docket Entry Nos. 179 at 11, 188 at 151). The defendants argue the exclusion removes hydraulic transducers from the '172 Patent. (Docket Entry No. 183 at 10).

If "coupled" refers to connecting the sensor to the drilling line, then: (1) Auto-Dril stipulated to exclude hydraulic sensors from infringement; and (2) the disputed claim terms, "a bit weight sensor" and "sensor means," are indefinite. If "coupled" refers to connecting the sensor to the rest of the system: (1) hydraulic sensors are not excluded; and (2) the terms are not indefinite.

Stewart, Auto-Dril's expert, gave the following testimony:

STEWART: There were instances where the automatic—where the—the big—the big up—or the big improvement that I felt like was actually moving the signal from the strain gauge to the controller electronically rather than hydraulically through hydraulic hoses.

Q: And you said that was coupling the two electrically?

STEWART: Correct.

Q: So, that would be putting a wire between the sensor and the bit weight comparison mean as opposed to a hydraulic hose?

STEWART: Or the box.

Q: Box. Sure. We can call it that.

STEWART: Yeah.

(Docket Entry No. 186-1 at 6). This is consistent with the claim 1 statement that "a bit weight sensor . . . is electrically coupled to a [sic] electronic bit weight comparison means . . . ." (Column 8, lines 34–38). Stewart's testimony and the claim language suggest that "coupled" refers to the connection between the sensor and the rest of the system.

The specification is less clear. One specification provision states: "The system of the present invention provides means coupled to the deadline for obtaining a weight reading on the drill stem." (Column 2, lines 58–60). Another states: "An exemplary sensor assembly 41 is illustrated in FIG. 3A in which is shown a sensor 44 coupled to a drilling line 20." (Column 5, lines 13–14). The word "coupled" is used to describe the sensor as attaching to the drill line, not connecting to the rest of the system.

The conflicting uses of the word "coupled" create a genuine factual dispute material to determining indefiniteness, precluding summary judgment on this issue. FED. R. CIV. P. 56(a). Auto-Dril's third motion for partial summary judgment as to the claim terms "a bit weight sensor" and "sensor means," (Docket Entry No. 179), is denied.

E. Construing "a signal proportionate to any difference between said actual bit weight and said pre-selected bit weight value" and "said signal"

i. The parties' contentions

Auto-Dril argues that "a signal proportionate to any difference between said actual bit weight and said pre-selected bit weight value" and "said signal" need no construction. (Docket Entry No. 171-22 at 5). Alternatively, it argues that the claim terms mean:

> [E]lectrical impulses that have qualities that, in the drilling system, affect the rotating speed of an electric motor and that, based on a measured difference between a target, user-input weight-on-bit versus the weight-on-bit represented by measurements from

a weight-on-bit or hookload sensor, change the rotating speed to produce the target weight-on-bit.

Id. The defendants argue that the terms mean "[a] signal representing only the difference between actual bit weight and pre-selected bit weight." Auto-Dril objects to the defendants' use of the word "only," arguing that it impermissibly limits claim 1 of the '172 Patent. (Docket Entry No. 134 at 9–10). The defendants respond that the claim language and specification justify limiting the claim. (Docket Entry No. 135 at 26).

ii. Analysis

Claim 1 defines a "bit weight comparison" as one that "compares actual bit weight indicated by said bit weight sensor against a user-selected, bit weight value set into said electronic bit weight comparison means, and generates a signal proportionate to any difference between said actual bit weight and said pre-selected bit weight value." (Column 8, lines 39–44). "Signal" is referred to again later in the claim. (Column 8, lines 49–51 ("upon receipt of signals from said electronic bit weight comparison means according to the value of *said signal*" (emphasis added))).

Auto-Dril's proposed construction describes how the signal affects the rotating speed of the electric motor. The proposed construction goes beyond the claim term, which does not describe how the signal interacts with the rest of the apparatus. Rather, the "signal" is defined as representing a single value; the difference between the actual bit weight and the pre-selected bit weight. "[T]he logic of the claim language itself limits the invention." *Nat'l Oilwell Varco, L.P. v. Omron Oilfield & Marine, Inc.*, 2013 WL 8508579, at *5 (W.D. Tex. Aug. 30, 2013) (citing *800 Adept, Inc. v. Murex Sec., Ltd.*, 539 F.3d 1354, 1363 (Fed. Cir. 2008)). The defendants' proposed construction, on the other hand, does not differ from the clear meaning of the claim language.

"A signal proportionate to any difference between said actual bit weight and said pre-

selected bit weight value" and "said signal" are construed to mean "a signal representing only the difference between the actual bit weight and the pre-selected bit weight value."

F. Construing "variable motor control signal in proportion to any measured weight-on-bit"

i. The parties' contentions

Auto-Dril argues that the claim term "variable motor control signal in proportion to any measured weight-on-bit" does not need construction. (Docket Entry No. 171-22 at 12). Alternatively, it argues that the term means "electrical impulses that are produced by the motor control signal output means and that have qualities that can be changed to represent the rotating speed of an electric motor." *Id.* The defendants argue that the term means "a signal representing only measured weight-on-bit." *Id.*

ii. Analysis

Like the previous claim terms, "variable motor control signal in proportion to any measured weight-on-bit" refers to a specific value. The signal is of the weight-on-bit, not the difference between the actual bit weight and the pre-selected bit weight. The defendants' construction is consistent with the clear claim language.

What distinguishes this term from the previous terms are the words "variable motor control." The '172 Patent describes how the variable motor-control signal affects the electronic motor speed. "The RPM of electric motor 82 is, as mentioned above, the product of the signal output of VFD 75 and, for reasons described hereafter, will be that substantially constant rate which optimally maintain the ROP which will, in turn, assure the desired WOB." (Column 6, lines 1–5). Auto-Dril's proposed construction properly incorporates the effect the signal has on the motor. But not all of Auto-Dril's proposed language is necessary. The words "qualities that can be changed" are not

necessary. The fact that the signal is "in proportion" to any measured weight-on-bit makes it clear that it fluctuates depending on the weight-on-bit.

"Variable motor control signal in proportion to any measured weight-on-bit" is construed to mean "a signal in proportion to any measured weight-on-bit that controls the electric motor speed."

G. Construing "braking means"

i. The parties' contentions

Auto-Dril argues that "braking means" is not subject to §112(6) and does not need construction. (Docket Entry No. 171-22 at 6). Alternatively, Auto-Dril argues that if this claim term is subject to § 112(6), then its function is "to apply force to an object to resist that object's movement," and its structure is disclosed in Figure 2 and at Column 1, lines 29–31, Column 3, lines 5–12, Column 4, lines 46–50, and Column 5, lines 53–57, and equivalents.

The defendants respond that "braking means" is "only described in terms of its function to impart 'proportional' movement to the drill string, which makes it impossible for Auto-Dril to overcome that [the claim term] is a means-plus-function claim element." (Docket Entry No. 135 at 26). They assert that the claim term is "limited to the drawworks's band brake lever handle coupled to the 'variable drive electric motor gearbox with a wire' (or its equivalents)." (Docket Entry No. 171-22 at 6). The issue is whether "braking means" is a means-plus-function element, subject to § 112(6), limiting it to the corresponding structures and equivalents described in the specification.

ii. Analysis

"When a claim uses the term 'means' to describe a limitation, a presumption inheres that the inventor used the term to invoke § 112, ¶ 6." *Biomedino*, 490 F.3d at 950. "This presumption can

be rebutted when the claim, in addition to the functional language, recites structure sufficient to perform the claimed function in its entirety." *Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1375 (Fed. Cir. 2003). "The standard is whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure." *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015) (citing *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996)).

In claims 1 and 3, "braking means" expresses a means for performing a certain function. Claim 1 states that the function is "to proportionately effect movement of said drill string in said upward or downward direction upon receipt of signals from said electronic bit weight comparison means according to the value of said signal." (Column 8, lines 47–51). Claim 3 states that the function is "moving . . . at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation . . . ." (Column 10, lines 9–11). Because "braking means" expresses a function, it is subject to § 112(6).

The parties agree that the '172 Patent discloses sufficient structure for "braking means." (Docket Entry No. 171-22 at 6). The parties dispute the nature and scope of the disclosed structure. Auto-Dril argues that the structure is the braking assembly disclosed throughout the '172 Patent, and its equivalents. The defendants argue that the structure is limited to the band brake lever handle on the drawworks, coupled to the "variable drive electric motor gearbox with a wire," or its equivalents. *Id.*

The specification includes several disclosures of the brake system. They are:

- "The rate of feed out of the drill line from the drum is controlled by a hand brake operated by a conventional brake lever." (Column 1, lines 29–31);

- "The electric motor mounted to a gearbox of the system of the present invention . . . rotates at a substantially constant rate which is determined . . . to actuate the brake lever to a degree that a desired weight-on-bit is maintained . . . ." (Column 3, lines 5–12);
- "The cable 20 has one end thereof wound on a drum 22, the rotation of which is controlled by a power brake mechanism 24 and a prime mover, e.g. a diesel engine and/or a diesel-electric engine." (Column 4, lines 46–50);
- "[A] conventional brake mechanism 24 is comprised of a brake band 32 engageable with the drum 22 via a brake lever 34, a brake lever biasing spring 36 connected between the brake lever 34 and a stationary rig or platform surface. It will be appreciated, however, that other braking systems may also be utilized in a manner consistent with the objectives of the invention." (Column 4, lines 55–62); and
- "The electric motor 82 drives a conventional draw works gearbox 89 with a clutched cable reel 92 rotatably carried on an output shaft 91. Cable reel 92 carries cable 90 which, in turn, is attached to brake handle 34 in the conventional manner." (Column 5, lines 53–58).

The specification discloses a brake band, engageable with the drum using a brake lever or handle, connected to a stationary rig or platform surface using a brake-lever-biasing spring. (Column 4, lines 55–59; Docket Entry No. 171-3 at ¶¶ 11, 35 (Stewart's declaration)). The specification discloses how the brake lever or handle is connected to the drawworks gearbox. (Column 5, lines 53–58 ("The electric motor 82 drives a conventional draw works gearbox 89 with a clutched cable reel 92 rotatably carried on an output shaft 91. Cable reel 92 carries cable 90 which, in turn, is attached to brake handle 34 in the conventional manner."); Docket Entry No. 1-1 at 4 (Figure 2)). The disclosed structure is sufficient. *Williamson*, 792 F.3d at 1349. Equivalents

of the disclosed structure are covered by the claim term. (Column 4, lines 55–62 ("It will be appreciated, however, that other braking systems may also be utilized in a manner consistent with the objectives of the invention.")).

"Braking means" is a means-plus-function claim element governed by § 112(6). Its function is to "proportionately effect movement of said drill string in said upward or downward direction upon receipt of signals from said electronic bit weight comparison means according to the value of said signal" and "moving . . . at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation." The sufficiently disclosed structure is "a brake band, engageable with the drum via a brake lever or handle, connected to a stationary rig or platform surface via a brake lever biasing spring, and where the brake handle is connected to the drawworks gearbox via cable," and its equivalents.

H. Construing "electronic bit weight comparison means" and "computer data and program processing means"

i. The parties' contentions

The claim terms "electronic bit weight comparison means" and "computer data and program processing means" are related. Auto-Dril combines them in its first motion for partial summary judgment, asserting that the terms are not indefinite under § 112(2). (Docket Entry No. 175). The parties stipulate that the terms are computer-implemented means that require algorithms. (Docket Entry Nos. 135 at 13, 171 at 6).

Auto-Dril argues that "electronic bit weight comparison means" and "computer data and program processing means" have the same function of "comparing actual bit weight indicated by said bit weight sensor against a user-selected, bit weight value set into the electronic bit weight comparison means, and generat[ing] a signal proportionate to any difference between said actual bit

weight and said pre-selected bit weight value." (Docket Entry No. 171-22 at 4, 11). Auto-Dril argues that the structure for "electronic bit weight comparison means" is disclosed as the "[programmable logic controller] operating algorithm set forth in specification in prose and equivalents," and that the structure for "computer data program processing means" is disclosed as "the algorithm, for operation by the logic-processing subcomponent of a [programmable logic controller], as set forth in specification in prose and equivalents" at Column 5, lines 36–46, Column 6, line 1–Column 7, line 44, and Figure 2. (Docket Entry No. 171-22 at 4, 11). The difference between the terms, according to Auto-Dril, is that "electronic bit weight comparison means" refers generally to a programmable logic controller, and "computer data and program processing means" refers to the specific logical circuit within a programmable logic controller that executes the algorithm. (Docket Entry No. 175 at 25).

The defendants argue that the claim terms are indefinite because the specification does not sufficiently disclose structure in the form of an algorithm. *Id.* The issue is whether these claim terms disclose a structure and algorithm corresponding to the function.

ii. Analysis

To decide whether § 112(6) is satisfied, courts ask "whether one of skill in the art would understand the specification itself to disclose a structure, not simply whether that person would be capable of implementing that structure." *Aristocrat Techs. Australia Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1337 (Fed. Cir. 2008) (citing *Biomedino*, 490 F.3d at 953); *see also Elekta*, 344 F.3d at 1212 ("The correct inquiry is to look at the *disclosure* of the patent and determine if one of skill in the art would have understood that *disclosure* to encompass software [with sufficient structure to perform the recited function], not simply whether one of skill in the art would have been able to

write such a software program."). In the computer-implemented means-plus-function context, a patentee may express an algorithm "in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure." *Finisar*, 523 F.3d at 1340.

Auto-Dril cites different parts of the specification to support its argument that the '172 Patent sufficiently discloses the algorithm for "electronic bit weight comparison means" and "computer data and program processing means." (Docket Entry No. 175-4 at 3, 6). Auto-Dril cites the following excerpt:

> Referring principally to FIGS. 2 and 3A, sensor 44 produces a 4–20 milliamps proportional output analog electrical signal, which is transmitted along electrical line 60 to a programmable logical controller ("PLC") 70, which preferably includes an analog to digital current converter 71, such as a current converter made by Automation Direct. Converter 71 converts the 4–20 milliamps proportional output analog electrical signal to a scaled digital signal, e.g. a signal with a discrete value from 0 to 4095. A power supply 69 supplies electrical power to electrical components such as the PLC 70.
>
> The PLC 70 also receives an electrical signal representing a desired weight of bit ("WOB") input from a touch-screen monitor 72, on which the user may selectively enter or adjust the desired WOB or setpoint. The PLC, using program logic as will be explained below, then compares the current WOB (derived from the input sensor assembly 41) to the desired WOB or set point. If the current weight on bit is less than the set point then the PLC will ramp up its digital output signal. This digital output signal will range from an output value of 0 to 4095.

(Column 5, lines 25–45).

Auto-Dril also cites the parts of Columns 6 and 7 that describe how the "PLC 70 continuously compares the desired WOB to the extrapolated WOB and adjusts the RPM of motor 82," Column 6, lines 6–7, and how "[t]he precise management of RPM of electric motor 82, and with it, all the desired parameters described above, is achieved by certain functionalities which are products of the software or firmware by which PLC 70 operates," (Column 6, lines 20–23). These

parts of the specification provide lengthy examples of how the programmable logic controller reacts to the change in actual bit weight:

> The principle operation of the PLC 70's software or firmware is summarized as follows: The program works on X range of weight variance from the setpoint representing the maximum PLC output. For example let us say that at one point in time, the PLC has the range set to 10 which represents 10,000 lbs of variance below the setpoint. If 30,000 lbs is the desired WOB, then 4095 output would be attained at 20,000 lbs WOB. One should never actually reach 4095 in output during normal drilling, because the system would correct for such a variance before reaching that point . . . .
>
> The PLC is constantly monitoring the relationship between WOB and WOB setpoint. PLC 70 can be set to make adjustments to the range up or down according to that relationship every 0.3 seconds. Returning to our example: suppose the drill bit encounters slightly softer formation and the earth drills away faster causing a loss of WOB. Now, in order to maintain the desired WOB, one needs to drill faster (increase the ROP).
>
> By repeatedly comparing setpoint WOB to actual WOB, the PCL [sic] 70 will detect this change of circumstance. Let us use a 150 lbs. as a detected variance from setpoint after the softer strata is encountered. PLC 70 will then subtract 300 lbs (as an example, depending on programming) from the above mentioned range of 0–10,000 lb variance range. Now 4095 of output would theoretically happen at 9,700 lbs away from the setpoint, rather than the earlier 10,000 lbs. With the reduction of the overall range, the output at approximately 500 lbs. away may now average 850 in PLC output, resulting in average hz. output of the VFD being 20 hz. This results in more gearbox speed and therefore more ROP. The PLC will continue to decrease the overall range and a reduction in hertz output per lb. away from the setpoint. In this format the WOB will float slightly above and below the setpoint maintaining that constant drilling or "peel" but at the same time keep the variance from set point with 500 lbs. to either side.

(Column 6, lines 28–38, 51–Column 7, line 11). The specification states that "[p]rogramming to achieve the above results are well within the skills of a competent programmer upon reference to this disclosure, and actual code examples or routines are not required for present purposes." (Column 7, lines 12–15).

The specification continues:

> One additional aspect of the PLC logic deserves mention: If one considers the above basic premises, one would suspect that when WOB is at zero variance form the WOB setpoint the PLC output would be zero, and the electric motor 82 and the attached gearbox 89 would, therefore, be stopped and then spin up as the WOB fell below the setpoint. . . .
>
> Because there should be a certain amount of gearbox rotation to move the brake handle to any degree, one should maintain some degree of output or "lead" in the range so that the right gearbox rpm can be attained with minimal variance from the setpoint. In other words, if PLC 70 has determined from the example above that a 9,700 lbs variance range is required to provide the needed hertz and rpm for the given conditions, PLC 70 may shift 2000 lb. of that range above the setpoint and leave the remaining 5700 lb. below the setpoint. That way, one attains the desired 850 PLC output and 20 htz. output to achieve the necessary rpm basically at the set point.

(Column 7, lines 16–21, 25–36).

Auto-Dril also cites testimony of Porche, Miller, and Stewart. In his *Pason* declaration, Porche stated:

> A POSITA would understand that a [programmable logic controller], with an algorithm that adjusts the output range of the [programmable logic controller] from a subtraction of the actual weight on bit from a setpoint to establish a variance range for the [programmable logic controller's] output values, and assigns a value to the output, or its equivalents, as disclosed in Ray '172, 5:39-44 and 6:6-19, discloses the appropriate structure for "program processing means." A POSITA would have the knowledge and find it obvious to use computers, [programmable logic controller's], or their equivalent from the Guggari '951 FIG. 2 disclosure, along with the associated programming, to implement the desired function of the Bowden '359 with predictable results.

(Docket Entry No. 171-1 at ¶ 28). Miller stated in his report that he would "be readily able to 'program' a [programmable logic controller]" to perform the functions of both claim terms based on the claim language "without even looking at the rest of the '172 patent." (Docket Entry No. 171-2 at ¶¶ 19, 24). Stewart's declaration stated:

> [A] POSITA would understand that a [programmable logic controller] (or other programmable computer), with an algorithm that adjusts the output range of the [programmable logic controller] from a subtraction of the actual weight on bit from

> a setpoint to establish a variance range for the [programmable logic controller's] output values, and assigns a value to the output, or its equivalents, as disclosed in '172, 5:39-44 and 6:16-19, discloses the appropriate structure for "electronic bit weight comparison means." The structure for performing the "computational means" function is simple computational capability, readily obtained in the field, to digest how much weight the electronic bit weight is measuring.

(Docket Entry No. 171-3 at ¶ 25).

The specification does not contain formulas, prose, or flow charts, all or any of which could be an algorithm. But, as Auto-Dril correctly argues, an algorithm is disclosed if it is expressed "in any . . . manner that provides sufficient structure." *Finisar*, 523 F.3d at 1340. "When the specification discloses some algorithm, . . . the question is whether the disclosed algorithm, from the viewpoint of a person of ordinary skill, is sufficient to define the structure and make the bounds of the claim understandable." *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1313 (Fed. Cir. 2012). But "while '[i]t is certainly true that the sufficiency of the disclosure of algorithmic structure must be judged in light of what one of ordinary skill in the art would understand the disclosure to impart,' in a situation in which the specification discloses no algorithm, '[t]hat principle ... has no application . . . .'" *Id.* (citing *Aristocrat*, 521 F.3d at 1337).

Porche's and Stewart's testimony do not show that the '172 Patent sufficiently discloses an algorithm for "electronic bit weight comparison means" or "computer data and program processing means." Their testimony acknowledges that *an* algorithm is needed to perform the function of adjusting the programmable logic controller's output range by subtracting the actual weight on bit from a user-selected value, creating a variance range for the controller's output values, and assigning a value to the output. But the specification "merely provides functional language and does not contain any step-by-step process" for programming the programmable logic controller so that it can perform the claim terms' function. *Ergo Licensing, LLC v. CareFusion 303, Inc.*, 673 F.3d 1361,

1365 (Fed. Cir. 2012). More information about the algorithm is needed.

The record evidence does not show that "the disclosed algorithm, from the viewpoint of a person of ordinary skill, is sufficient to define the structure and make the bounds of the claim understandable." *Noah Sys.*, 675 F.3d at 1313. Miller stated that he would have to "program" a programmable logic controller before it could perform the functions of "electronic bit weight comparison means" and "computer data and program processing means." (Docket Entry No. 171-2 at ¶¶ 19, 24). Although Miller testified that it could be done, the algorithm needed to do it is not disclosed. Stewart gave similar testimony:

> Q: You designated yourself as a person of ordinary skill in the art, correct?
>
> STEWART: Correct.
>
> . . .
>
> Q: You shared with me earlier you don't do any programming, correct?
>
> STEWART: Correct.
>
> . . .
>
> Q: So, when it comes down to the programmable control means and your cite to column 5, lines 36 to lines 54, you would need to hire a programmer to develop an algorithm to perform these functions?
>
> STEWART: Correct.

(Docket Entry No. 148-1 at 28–29).

Miller and Stewart are both people of ordinary skill in the art. One does, and one does not, have the skills and knowledge needed to program the programmable logic controller. Their testimony demonstrates that the programmable logic controller would need to be programmed in order to perform the functions of "electronic bit weight comparison means" and "computer data and

program processing means." The specification does not disclose any algorithm to perform the claim functions. One skilled in the art of programming would have to create the function-performing algorithm. *Elekta*, 344 F.3d at 1212 ("The correct inquiry is to look at the *disclosure* of the patent and determine if one of skill in the art would have understood that *disclosure* to encompass software . . . and been able to implement such a program, not simply whether one of skill in the art would have been able to write such a software program."); *Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1385 (Fed. Cir. 2009) ("A patentee cannot avoid providing specificity as to structure simply because someone of ordinary skill in the art would be able to devise a means to perform the claimed function.").

The claim terms "electronic bit weight comparison means" and "computer data and program processing means" are indefinite under § 112(2). Auto-Dril's first motion for partial summary judgment, (Docket Entry No. 175), is denied.

I. Construing "electronic weight-on-bit comparison means" and "programmable logic controller"

i. The parties' contentions

The claim terms "electronic weight-on-bit comparison means" and "programmable logic controller" are related, and Auto-Dril combines them in its second motion for partial summary judgment. Auto-Dril asserts that the terms are not indefinite under § 112(2). (Docket Entry No. 176). The parties dispute whether the claim terms are computer-implemented means-plus-function terms. (Docket Entry No. 171-22 at 7, 9).

Auto-Dril argues that "electronic weight-on-bit comparison means" is not a means-plus-function element. (Docket Entry No. 171 at 8). Alternatively, Auto-Dril argues that the claim term has a specific function—"storing program logic, data received from said sensor, and user input

data"—and a structure—a programmable logic controller and its equivalents—disclosed in the specification at Column 5, lines 25–57, Column 6, lines 28–39, and Figure 2, to execute the algorithm disclosed at Column 5, lines 36–46, Column 6, line 1–Column 7, line 44, and Figure 2. (Docket Entry No. 171-22 at 9). Auto-Dril argues that "programmable logic controller" does not need construction. *Id.* at 7. Alternatively, it asserts that the term means "a computer control system that monitors the state of input devices and is capable of making decisions based upon a custom program to control the state of output devices." *Id.* The defendants argue that both claim terms are computer-implemented means-plus-function terms that are indefinite under § 112(2) because the specification does not sufficiently disclose a structure in the form of an algorithm needed for the claimed functions. *Id.* at 7, 9.

ii. Analysis

Though "electronic bit-weight-comparison means" is similar to "electronic bit weight comparison means," the two terms require separate summary judgment analyses because only "electronic bit weight comparison means" is a means-plus-function term subject to § 112(6). "The use of the term 'means' triggers a rebuttable presumption that § 112, ¶ 6 governs the construction of the claim term." *Robert Bosch, LLC v. Snap-On Inc.*, 769 F.3d 1094, 1097 (Fed. Cir. 2014). "[T]he focus remains on whether the claim as properly construed recites sufficiently definite structure to avoid the ambit of § 112, ¶ 6." *Personalized Media*, 161 F.3d at 704.

Claim 3 states:

> A control system for governing drawworks braking in an earth drilling apparatus which includes a drill stem comprising:
> . . .
>
> electronic weight-on-bit comparison means comprising:

> computer and memory means for storing program logic, data received from said sensor, and user input data.

(Column 8, lines 55–67). Claim 2 is similar: "[t]he automatic drilling system of claim 1 where the electronic bit weight comparison means includes a programmable logic controller." (Column 8, lines 52–54). Neither claim discloses a function of a "programmable logic controller." Instead, they describe the "electronic weight-on-bit comparison means" structural components.

Neither "electronic weight-on-bit comparison means" nor "programmable logic controller" are means-plus-function terms. Neither is "expressed as a means or step for performing a specified function." 35 U.S.C. § 112(6). Because they "describ[e] the item or element to be used" rather than the "result accomplished or the function served," they are not subject to § 112(6). *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 27 (1997). To the extent the parties submit opinions from Rule 702 witnesses that the terms are means-plus-function terms that lack sufficient structure because a programmer would have to develop the undisclosed algorithm needed to perform the claimed functions, those opinions are inconsistent with the patent language and do not bind the court. *Markman*, 52 F.3d at 983.

The claim terms "electronic weight-on-bit comparison means" and "programmable logic controller" are not means-plus-function terms and are not indefinite under § 112(2). Auto-Dril's second motion for partial summary judgment as to the claim terms "electronic weight-on-bit comparison means" and "programmable logic controller," (Docket Entry No. 176), is granted.

J. Construing "programmable control means" and "motor control signal output means"

i. The parties' contentions

The claim terms "programmable control means" and "motor control signal output means"

are related, and Auto-Dril combines them in its second motion for partial summary judgment, asserting that the terms are not indefinite under § 112(2). (Docket Entry No. 176). Auto-Dril argues that "programmable control means" and "motor control signal output means" have the same function, "to variably control the speed of a coupled electric motor in proportion to signals received from the electronic bit weight comparison means." (Docket Entry No. 171-22 at 5, 11). Auto-Dril argues that the structure for each term is a "[variable frequency drive] and equivalents," sufficiently disclosed at Column 5, lines 47–53. *Id.*

The defendants respond that both terms are computer-implemented means-plus-function terms that are indefinite under § 112(2) because the specification does not sufficiently disclose the structure in the form of an algorithm. *Id.* at 5, 11. Auto-Dril concedes that the claim terms are means-plus-function elements but insists that these are not computer-implemented elements. (Docket Entry No. 176 at 22).

ii. Analysis

"Programmable control means" appears in claim 1, which states:

> [P]rogrammable control means operatively coupled to a variable drive electric motor which is interfaced with drill stem braking means to proportionately effect movement of said drill string in said upward or downward direction upon receipt of signals from said electronic bit weight comparison means according to the value of said signal.

(Column 8, lines 45–51). "Motor control signal output means" appears in claim 3:

> [M]otor control signal output means for generating a variable motor control signal which is proportionate to a desired speed of operation of an electric motor operatively connected to said motor control signal output means.

(Column 9, lines 7–11). Auto-Dril cites the same specification for both terms:

> The digital output signal is sent along a first signal path 77 to a variable frequency drive ("VFD") 75 which will, in turn, send a variable amount of alternating electrical current at a variable frequency along a second signal path 79 to an electric motor 82.

> In this way, the amount of current sent to the electric motor 82 (and, accordingly, its RPM) will depend on the value of the output signal from the [programmable logic controller].

(Column 5, lines 46–52).

The specification describes how the electronic signal travels from the programmable logic controller to the variable frequency drive, which in turn sends a signal to the electric motor to control the motor speed. The specification is consistent with the claim language explaining that "programmable control means" and "motor control signal output means" are "coupled" or "connected" to the electric motor and generate a signal that controls the speed of the electric motor. Auto-Dril's proposed construction correctly describes the claimed function as "variably control[ling] the speed of a coupled electric motor in proportion to signals received from the electronic bit weight comparison means." (Docket Entry No. 171-22 at 5).

Auto-Dril is also correct that the specification discloses a "variable frequency drive" as the structure for "programmable control means" and "motor control signal output means." (Column 5, lines 46–47 ("The digital output signal is sent along a first signal path 77 to a variable frequency drive . . . ."). Expert testimony confirms this point. (Docket Entry Nos. 134-1 at ¶ 27, 188 at 101–102; Docket Entry No. 176-3 at ¶¶ 20, 27 ("A POSITA would understand that a motor drive capable of controlling a variable drive electric motor such as a variable frequency drive (VFD) or equivalents, as disclosed in Ray '172, 5:46-52, discloses the appropriate structure for ['programmable control means'/'motor control signal output means'].")).

The issue is whether the claim terms are computer-implemented means-plus-function terms, and, if so, whether more is needed in the specification to disclose a corresponding algorithm. Auto-Dril argues that a variable frequency drive is a "specialized device," not a general-purpose computer.

(Docket Entry No. 176 at 22–24). Auto-Dril primarily relies on Miller's testimony to support the assertion that variable frequency drives are "special-purpose devices." (Docket Entry No. 176 at 23). Miller's expert report does not provide this support. It states:

> [Variable frequency drives] are, and were at the time of the '172 patent, widely available electronic control units used to effectively and precisely deliver electric power to electric motors in order to control the speed or position of electric motors. [Variable frequency drives] are *general purpose* and can be used in many different applications without special programming. [Variable frequency drives] have been on the market and generally available since well before 2002. Again, these devices do not require any special programming to achieve their purpose and conventional function of affecting control of the motor. The devices do contain an embedded processing element, but this element is a sub-component of the overall assembly. This processor also includes software or firmware developed and distributed by the manufacturer as a sub-component of the assembly which also required no special programming—functional as intended "off-the-shelf."

(Docket Entry No. 168-1 at ¶ 13 (emphasis added)).

Auto-Dril also cites Stewart's testimony that "[u]sing a [variable frequency drive] to control a motor was well known to a POSITA" when the '172 Patent was filed. (Docket Entry Nos. 134-1 at ¶ 27, 176-3 at ¶ 20). But Stewart's testimony is not so clear. He also testified that achieving the claimed function would require using or hiring a programmer to develop an algorithm to perform the "programmable control means" function disclosed at Column 5, lines 36–54. (Docket Entry No. 148-1 at 29).

The record evidence on whether a variable frequency drive requires specialized programming creates a genuine factual dispute material to determining whether Auto-Dril is entitled to the summary judgment it seeks. FED. R. CIV. P. 56(a). Auto-Dril's second motion for partial summary judgment as to the claim terms "programmable control means" and "motor control signal output means," (Docket Entry No. 176), is denied.

K. Construing "signal input means"

i. The parties' contentions

Auto-Dril concedes that the claim term "signal input means" is a means-plus-function term. (Docket Entry No. 176 at 26). It argues that the claimed function is "receiving an electronic signal from an electronic sensor means and storing data representative of that electronic signal," and that the corresponding structure is sufficiently disclosed in the specification at Column 5, lines 25–35 and Figure 2, and its equivalents. (Docket Entry No. 171-22 at 10).

The defendants respond that the claim term is a computer-implemented means-plus-function term that is indefinite under § 112(2) because the specification does not sufficiently disclose its structure in the form of an algorithm. *Id.* Alternatively, the defendants assert that the term "is limited to a wire or equivalent structure and indefinite for failing to link this term with that structure anywhere in the specification." *Id.*

ii. The claim construction analysis

Claim 3 describes the "signal input means" as a "means for receiving said electronic signal from said sensor means and for storing data representative of said electronic signal." (Column 9, lines 4–6). Auto-Dril argues that the term "signal input means" refers to an "analog-to-digital converter unit" and its equivalents. (Docket Entry No. 176 at 26). Auto-Dril asserts that an analog-to-digital converter is a "special-purpose device designed and produced specifically to perform the claimed function," and not a general purpose computer. *Id.*

Auto-Dril relies on Miller's expert report, which states:

> [I]t is my opinion that [signal input means] would typically be understood in the industry to be what is called an "Analog to Digital Converter unit[."] This type of unit takes an analog signal and produces a digital representation of said signal available for computer processing. [Programmable logic controllers] will typically have "modules" or "cards" of various functionality. These cards can be input or output or a mix of either. These cards can also be analog or digital or either. Analog

> to Digital Converter "modules" or "cards" were available off-the-shelf in 2002. These off-the-shelf cards provided: (a) the digitization of analog data; and (b) the storage of the representative result into memory for processing without special programming. These were once again an off-the-shelf part, a sub-component, which provided a general purpose operation without the need for special programming. These units could digitize a voltage signal, a current loop signal or other types of analog signals. Now that these non-algorithm requiring claim elements have been addressed, I will continue with an analysis of those claim elements that, in my opinion, require, and are more than adequately supported by an algorithm in the '172 patent.

(Docket Entry No. 168-1 at ¶ 14).

Auto-Dril does not cite the testimony of Stewart, its other retained expert. Stewart testified that "[a] POSITA would understand that a programmable logic controller (PLC) or its equivalents, as disclosed in '172, 5:25-35, discloses the appropriate structure for a 'signal input means.' Even those with minimal industry experience know that 'signal input means' would include any of USB, SATA, PATA, Ethernet, and many others." (Docket Entry No. 134-1 at ¶ 31). Porche's *Pason* declaration similarly stated that the term "programmable logic controller," disclosed at Column 5, lines 25–35, adequately discloses the "signal input means" structure. (Docket Entry No. 176-3 at ¶ 26).

The specification provides:

> Referring principally to FIGS. 2 and 3A, sensor 44 produces a 4–20 milliamps proportional output analog electrical signal, which is transmitted along electrical line 60 to a programmable logical controller ("PLC") 70, which preferably includes an analog to digital current converter 71, such as a current converter made by Automation Direct. Converter 71 converts the 4–20 milliamps proportional output analog electrical signal to a scaled digital signal, e.g. a signal with a discrete value from 0 to 4095.

(Column 5, lines 25–33).

The specification refers to an analog-to-digital converter as "preferable," not required; the invention could operate without an analog-to-digital converter. The "signal input means" term in

claim 3 does not require an analog-to-digital converter as necessary structure. *Mass Engineered Design, Inc. v. Ergotron, Inc.*, 559 F. Supp. 2d 740, 749 (E.D. Tex. 2008), *opinion clarified*, 2008 WL 2697293 (E.D. Tex. May 30, 2008), *and amended*, 2008 WL 3483906 (E.D. Tex. Aug. 7, 2008) ("The specification makes clear that the projections and slots are preferable, which denotes they are not required."). Rather, the specification and expert testimony show that the '172 Patent discloses a programmable logic controller as the structure for "signal input means." (Column 5, lines 25–33; Docket Entry Nos. 134-1 at ¶ 31, 176-3 at ¶ 26).

iii. The summary judgment analysis

A programmable logic controller is a general purpose computing device. (Docket Entry No. 168-1 at ¶ 10; *id.* at ¶ 12 ("At the time of the invention (2002), [programmable logic controllers] were readily available as general data programming, processing, and data storage means to the public.")). The term "sensor input means," in the context of claim 3, is a computer-implemented means-plus-function term. The specification must disclose an algorithm for performing the function. *WMS Gaming*, 184 F.3d at 1349; *Harris*, 417 F.3d at 1253. The specification does not disclose an algorithm. Column 5, lines 25–33). The specification instead describes how an electrical signal is transmitted along an electrical line to the programmable logic controller; but the specification does not disclose how a programmable logic controller by itself could perform the function of "receiving said electronic signal from said sensor means and for storing data representative of said electronic signal." (Column 9, lines 4–6).

The '172 Patent does not disclose sufficient structure for the claim term "signal input means." The term is indefinite under § 112(2). Auto-Dril's second motion for partial summary judgment as to the claim terms "signal input means," (Docket Entry No. 176), is denied.

V. Conclusion

1. "Drill stem" is construed to mean "all members in the assembly used for rotary drilling from the swivel to the bit, including the kelly and the drill string."

2. "Alternatively move said stem upward and downward" is construed to mean "capable of moving the drill stem upward and downward during drilling."

3. "In said upward or downward direction" is construed to mean "capable of moving the drill string upward and downward during drilling."

4. "Moving said braking means at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation" is construed to mean "capable of moving the braking means to control the downward and upward movement of the drill string."

5. "A bit weight sensor" is construed to mean "a sensor, including a hydraulic bit weight sensor and an electronic bit weight sensor."

6. "Sensor means" is a means-plus-function claim element governed by § 112(6). Its function is to "measure weight-on-bit of said drill string configured for measuring bit weight directly through interface with bit support means which, at least in part, supports the weight of said drill bit, and generate an electronic signal proportionate to measured weight-on-bit during a drilling operation." Its sufficiently disclosed structure is "a sensor, including a hydraulic bit weight sensor and an electronic bit weight sensor" and its equivalents.

7. "A signal proportionate to any difference between said actual bit weight and said pre-

selected bit weight value" and "said signal" are construed to mean "a signal repenting only the difference between the actual bit weight and the pre-selected bit weight value."

8. "Variable motor control signal in proportion to any measured weight-on-bit" is construed to mean "a signal in proportion to any measured weight-on-bit that controls the electric motor speed."

9. "Braking means" is a means-plus-function claim element governed by § 112(6). Its function is to "proportionately effect movement of said drill string in said upward or downward direction upon receipt of signals from said electronic bit weight comparison means according to the value of said signal" and "moving . . . at proportional rates for controlling weight-on-bit upwardly or downwardly during a drilling operation." The sufficiently disclosed structure is "a brake band, engageable with the drum via a brake lever or handle, connected to a stationary rig or platform surface via a brake lever biasing spring, and where the brake handle is connected to the drawworks gearbox via cable" and its equivalents.

10. "Electronic bit weight comparison means" and "computer data and program processing means" are indefinite under § 112(2) for failure to disclose an algorithm.

11. "Electronic weight-on-bit comparison means" and "programmable logic controller" are not means-plus-function terms and are not indefinite under § 112(2).

12. "Signal input means" is indefinite under § 112(2) for failure to disclose an algorithm.

13. Auto-Dril's first motion for partial summary judgment, (Docket Entry No. 175), is denied.

14. Auto-Dril's second motion for partial summary judgment as to the claim terms "electronic weight-on-bit comparison means" and "programmable logic controller," (Docket Entry No. 176), is granted.

15. Auto-Dril's second motion for partial summary judgment as to the claim terms "programmable control means" and "motor control signal output means," and "signal input means," (Docket Entry No. 176), is denied.

16. Auto-Dril's third motion for partial summary judgment, (Docket Entry No. 179), is denied.

A status and scheduling conference is set for **Wednesday, April 18, 2018** at **9:00 a.m.**

SIGNED on April 20, 2018, at Houston, Texas.

Lee H. Rosenthal
Chief United States District Judge